Robogals Science Challenge

Minor Challenge Set #4
STEM Field: Electrical Engineering
Level: Senior
Challenge Name: Create Your LED Message with TinkerCAD
Materials required:

- Computer/laptop with internet access
- An account on TinkerCAD (a free software)

Introduction:

Arduino is a platform to create interactive electronic projects. We can use Arduino boards to read input, for example, light on a sensor, and turn it into an output, such as turning on an LED. If you want to tinker with a project that involves both softwar e (coding) and hardware (building electrical circuits), Arduino is a great way to start.

To work on an Arduino project, you will need an Arduino board, wires, batteries, resistors, LEDs and more components, depending on the project you are working on. It may be difficult to gather all the required components, therefore, in this activity, we wi ll use TinkerCAD - a free software with tools to build electronic circuits and simulate them.

This is an electronics design project, therefore, there will be some design specifications you are asked to meet. The design and implementation are up to you, and we hope you have fun experimenting with codes and a library of electronic components!

Instructions:

Navigate to the website: https://www.tinkercad.com . It is recommended that you open this website on a browser such as Chrome. This software is free-to-use, and creating an account is necessary to save the progress of your project.

- If you have not registered, click “JOIN NOW”, then select “Create a personal account”.

- Alternatively, click “Sign In” to log into your TinkerCAD account.

The goal of this project is to design a creative birthday message using LEDs. The design specifications for your birthday message are:

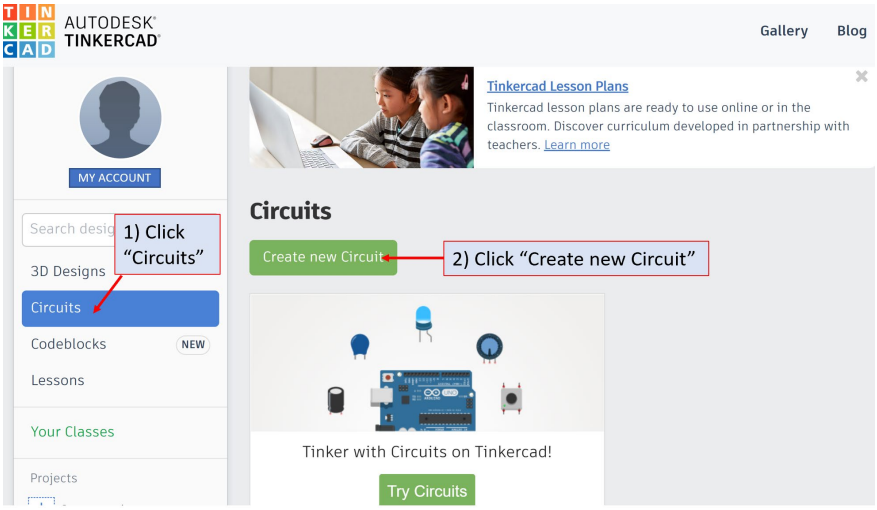
- Your message should be created by connecting LEDs together. There are no restrictions on how the LEDs are connected, how many LEDs you should use, or the colour of these LEDs.
- You should create an interactive LED display. That is, you should write some code so the LEDs turn on and off at different times. It is up to you to define the blinking time for these LEDs.
- You may want to use an Arduino for your project.
- There are no restrictions on how many batteries, resistors or other electronic components you can use.

For inspiration, you may want to explore TinkerCAD’s birthday message projects here - Happy Birthday TinkerCad

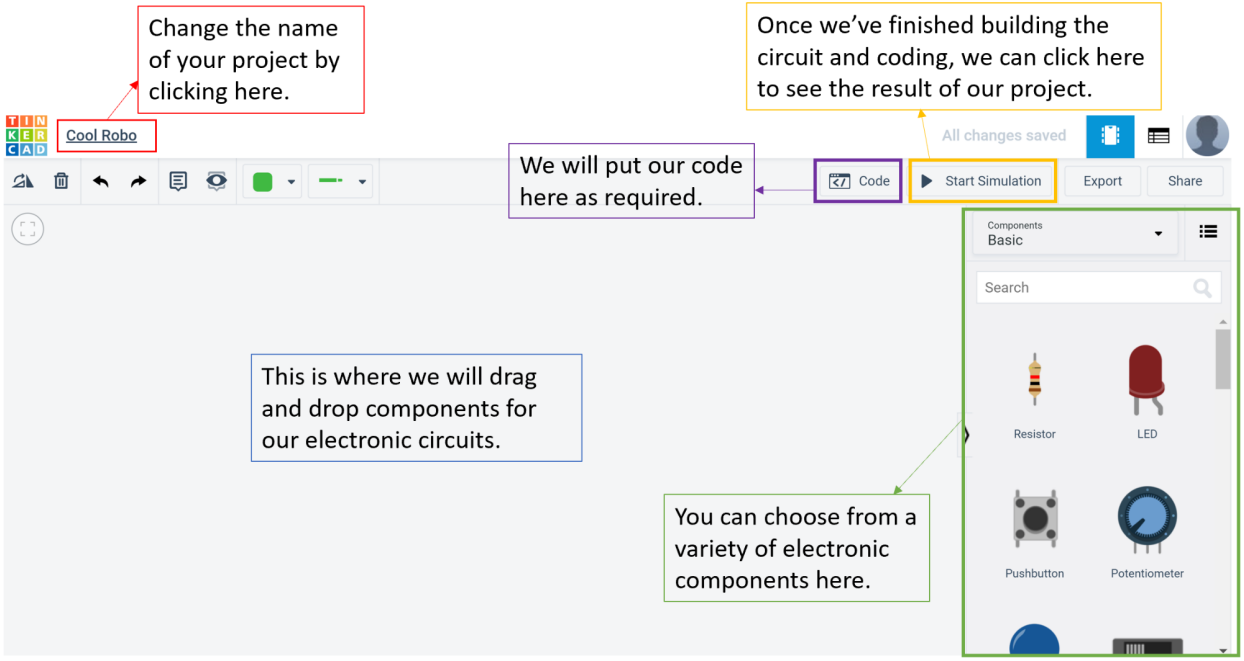
Please note that the circuit designs here can be very complicated. Your project can be a very simple message, with LEDs blinking at different times to create an interactive light display. (Unless you’re up for a challenge, in which case you can implement a more difficult design of any messages of your choice and submit it as a Major Challenge!)

Tips:

- We will be working with circuit designs, so it is important that you create a new project within the “Circuits” section. TinkerCAD can also be used for 3D modelling - so you can explore that feature for another challenge. Once you have logged in, choose “C ircuits”, then “Create new Circuit”.

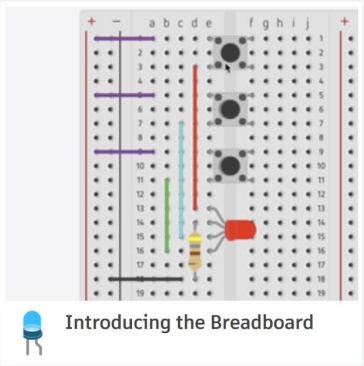


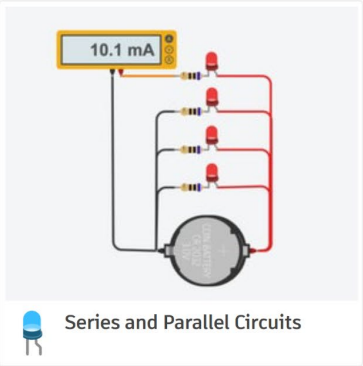
- Here is a quick summary of the project space once you have created a new project.



- TinkerCAD has many tutorials on series and parallel lighting circuits and how to use Arduino and LEDs for different projects. Once you have logged into the website, navigate to the "Circuits Lessons" section.

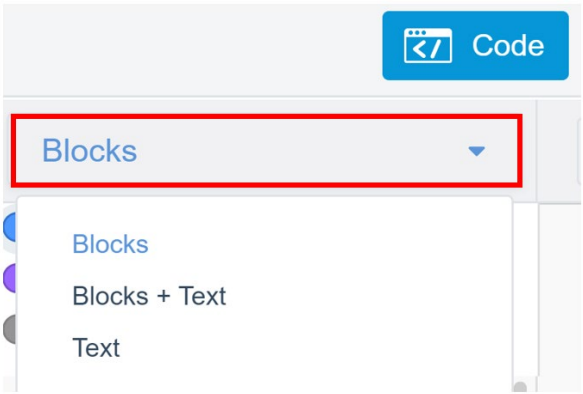
- To complete this project successfully, it is recommended that you complete the "Introducing the Breadboard", "Series and Parallel Circuits" in the Lessons section, and the following Arduino tutorials from the Projects section.



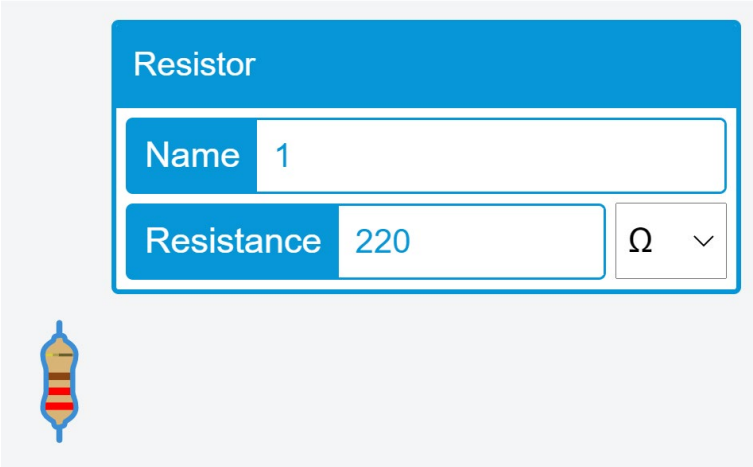


- When you use an Arduino for your project, you will need to add some code. Click on the 

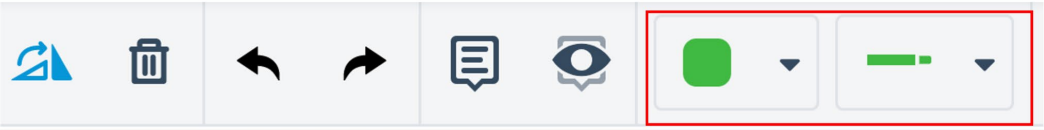
symbol, then click on the "Blocks" section (highlighted in red). You can choose to code using drag-and-drop blocks, or a combination of blocks and text, or in Arduino's text-based programming language.



- To specify values to electronic components such as resistors, first, drag the component to the project space. Then, click on the component once and edit the name and/or value.



- To change the colour and the type of wire used, you can select these boxes (highlighted in red) at the top left of your project space and edit it.



Reflection Questions:

- Are there any improvements you would make to this challenge?
- What real world application can you apply the challenge to?
- What are the key concepts of science and engineering that relate to this challenge?

- What was the most challenging part when working on your project? How did you overcome this challenge?
- What is one change you would make to improve your design? Why would this change make your design better?
- If you were to do this challenge again, what would you have done differently?

Submission Guidelines:

- Submit photos of your project and code. Include a short summary that addresses the Reflection Questions.

> **Note:** When submitting this Minor Challenge, please upload pictures of your project or experimental setup. Remember, if you want to upload pictures of your Minor Challenge that also include you, please check if it is OK with your mentor first.

- There is a submission form directly on the Minor Challenge page here: https://sciencechallenge.org.au/index.php/minor_-challenges/. Fill out the details and make sure you upload your submission.

Learn More! Resources:

- If you're looking for more Arduino tutorials - https://www.instructables.com/
- If you're looking for documents and getting started guide when using Arduino hardware - https://www.arduino.cc/en/Guide